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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/783,384	02/15/2001	Ching-Cheng Huang	MEG01-002	2323

28112 7590 11/26/2002

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EXAMINER

LEE, HSIEN MING

ART UNIT PAPER NUMBER

2823

DATE MAILED: 11/26/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/783,384

Applicant(s)

HUANG ET AL.

Examiner

Hsien-Ming Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 September 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27, 32, 33 and 36-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-14 is/are allowed.
- 6) ☒ Claim(s) 15-18, 22, 26, 27, 37 and 38 is/are rejected.
- 7) ☒ Claim(s) 19-21, 32, 33, 36, 39 and 40 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 February 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 10 September 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Remarks

1. Applicants' cancellation to claims 28-31 and 34-35 is acknowledged. Claims 1-27, 32, 33 and 36-40 are pending in the application.
2. The objections to drawings and to claims 15-18 and 21-25; the 112-second-paragraph rejection to claims 1, 2, 8, 9, 16, 17, 19, 29, 30 and 32; and 103(a) rejection to claims 1-40 are withdrawn in response to applicants' amendment filed 9/10/02.

Drawings

3. Figure 18b is objected to because the figure still shows the layer 33 having an intact portion on the left region of the bump metal 35 that has been etched in Fig. 18a. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

4. The disclosure is objected to because of the following informalities: on page 1, first paragraph, " serial number 09/760,909, assigned to a common assignee" should be -- serial number 09/760,909, now U.S. Patent 6,426,556, assigned to a common assignee --. Appropriate correction is required.

Double Patenting

5. Applicant is advised that should claims 26 and 27 be found allowable, claims 37 and 38 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof because claims 26, 27, 37 and 38 all depend from claim 15. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in

wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 15-23 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 10-15, 17, 20 and 21 of U.S. Patent No. 6,426,556. Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter recited in claims 15, 16, 17, 18, 19, 20, 21, 22 and 23 of the application is equivalent to claims 10, 11, 12, 13, 14, 15, 17, 20 and 21, respectively.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. Claims 15, 16, 17, 18 and 22 are rejected under 35 U.S.C. 102(e) as being anticipated by Lin (US 6,426,556).

In re claims 15 and 22, Lin, in Figs.9-11 and related text on col. 13 (claim 10), expressly teaches the claimed method for forming a metal bump on a semiconductor substrate, comprising the steps of:

- providing a semiconductor substrate 10, said semiconductor substrate 10 having been provided on the surface thereof with a contact pad 24 (Al), said contact pad 24 overlying a layer of dielectric 29, said layer of dielectric 29 having been deposited over said semiconductor substrate 10 (Fig.9); and
- partially removing said contact pad 24, said removing having a removal thickness and removal surface area 36 (Fig.11).

In re claim 16, Lin teaches that said removal surface area of said contact pad 24 is smaller than a surface area of said contact pad 24 by an amount as shown in Fig. 9.

In re claim 17, Lin teaches that said removal thickness (i.e. 28) of said contact pad 24 is less than a height of said contact pad 24 by an amount as shown in Fig. 10.

In re claim 18, Lin teaches that said removal thickness of said contact pad 24 equals a height of said contact pad 24 as shown in Fig. 11.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 26, 27, 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (US'556) in view of applicants' admitted prior art (hereinafter referred as "AAPA").

Lin substantially teaches the claimed method as stated above except that said contact pad is accessed by means of interconnect metal being provided in a plane of said contact pad; and overlying said layer of dielectric and said contact pad is accessed by means of at least one via provided through said layer of dielectric.

However, AAPA in an analogous art teaches contact pad 17' is accessed by means of interconnect metal 23' being provided in a plane of said contact pad and overlying said layer of dielectric 25' and said contact pad 17' is accessed by means of at least one via 21'/27' provided through said layer of dielectric (Figs. 20b, 20d and related text on page 26).

Therefore, it would have been obvious to one of the ordinary skill in the art at the time of the invention was made to form the interconnect metal and the via as taught by AAPA in conjunction with Lin's method of forming the metal bump since by doing so it would provide a channel for establishing electrical contact between the contact pad and surrounding electrical components (page 27, first paragraph of the instant specification).

Allowable Subject Matter

12. Claims 1-14 are allowed.

13. The following is a statement of reasons for the indication of allowable subject matter:

In re claims 1-7, Lin to US 6,426,556 substantially teaches the claimed method for forming a metal bump on a semiconductor substrate, comprising the steps of: providing a semiconductor substrate 10, said semiconductor substrate 10 having been provided on the surface thereof with a contact pad 24, said contact pad 24 sitting on an underlying layer of dielectric 29 and being in electrical contact with at least one point of electrical contact 33 on the surface of said substrate 10; depositing a layer of passivation 32 over the surface of said layer of dielectric 29 underlying the contact pad 24, including the surface of said contact pad 24; patterning and etching said layer of passivation 24, creating an opening in said layer of passivation 24 having a first diameter (Fig.9), partially exposing the surface of said contact pad 24 over a surface area of said first diameter, said first diameter of said opening created in said layer of passivation 32 being smaller than a surface area of said contact pad 24 by a measurable amount (Fig.9); etching said contact pad 24, *using a patterned layer of photoresist 37 as a mask*, partially first removing said contact pad 24 from above the surface of said layer of dielectric 29, creating an opening 36 in said contact pad 24 having a diameter being *smaller than* that of said first diameter (Fig.11); sputtering a layer of Under Bump Metallurgy (UBM) 33 over the surface of said layer of passivation 32, including said opening 36 created in said contact pad 24 (Fig.12); depositing and patterning a layer of photoresist 39, creating an opening 38 in the photoresist 39 with a slightly larger dimension than said first diameter (Fig.13); electroplating a layer of bump metal 35 in the photoresist opening 38 (Fig.14); stripping the layer of photoresist 39 and etching

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said layer of UBM 33, using said layer of bump metal 35 as a mask (Fig.15); and reflowing the surface of said layer of bump metal 35, forming the metal bump.

In contrast, Lin neither teaches nor suggests etching said contact pad, *using said layer of passivation as a mask*, partially or completely first removing said contact pad from above the surface of said layer of dielectric, creating a opening in said contact pad *having a diameter being about equal to said first diameter*.

In re claims 8-14, Lin also substantially teaches the claimed method for forming a metal bump on a semiconductor substrate, comprising the steps of: providing a semiconductor substrate 10, said semiconductor substrate 10 having been provided on the surface thereof with a contact pad 24, said contact pad 24 sitting on an underlying layer of dielectric 29; depositing a layer of passivation 32 over the surface of said layer of dielectric 29, including the surface of said contact pad 24; patterning and etching said layer of passivation 32, creating an opening in said layer of passivation 32 having a first diameter, partially exposing the surface of said contact pad 24 over a surface area of said first diameter, said first diameter of said opening created in said layer of passivation 32 being smaller than a surface area of said contact pad 24 by an amount.

In contrast, Lin at least neither teaches nor suggests depositing *a layer of polyimide over the surface of said layer of passivation*, including the opening created in said layer of passivation; patterning and etching said layer of polyimide, *creating an opening in said layer of polyimide* having a *second diameter*, partially exposing the surface of said contact pad over a surface area of said second diameter, said second diameter of said opening created in said layer of polyimide being *smaller than* said first diameter by an amount

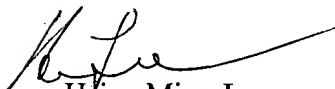
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14. Claims 19-21, 23-25, 32, 33, 36, 39, 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-0142 for regular communications and 703-305-0142 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


Hsien Ming Lee
November 21, 2002